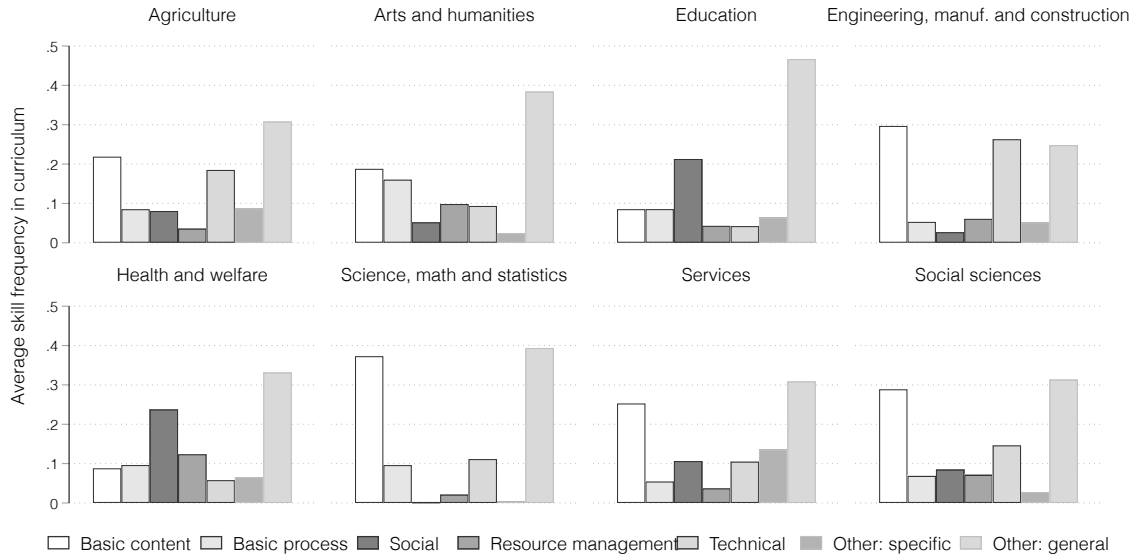


# Online Appendix A to "Learning the Right Skill"

Figure A1: Skill frequencies including "Other" categories, by field of education



Source: authors' calculations using curriculum data from SBB. The fields represent ISCED97 two-digit fields of education. Average skill frequencies are calculated using equation 1 and weighted by student population. The categories "Other: specific" and "Other: general" contain verb-noun combinations that could not be labeled to any of the O\*NET skill categories. For descriptions of each skill category and underlying verb-noun combinations, please refer to the Appendix Table A1. A figure without "Other" categories is presented in Figure 3 in the main text.

**Table A2: Descriptive statistics, by gender, level, apprenticeship-type, sector of employment and firm size**

	By gender			By level			By type	
	Total (1)	Men (2)	Women (3)	Level 2 (4)	Level 3 (5)	Level 4 (6)	BOL (7)	BBL (8)
<i>Skills</i>								
Basic content	0.221	0.275	0.166	0.235	0.194	0.229	0.224	0.214
Basic process	0.077	0.068	0.087	0.063	0.059	0.092	0.085	0.055
Social	0.114	0.071	0.158	0.076	0.127	0.120	0.121	0.097
Resource management	0.075	0.060	0.091	0.028	0.086	0.086	0.073	0.081
Technical	0.132	0.177	0.086	0.221	0.139	0.097	0.105	0.203
Specific	0.068	0.046	0.090	0.071	0.102	0.049	0.063	0.082
General	0.313	0.304	0.323	0.307	0.292	0.326	0.330	0.268
Log hourly wage	2.470	2.463	2.478	2.322	2.482	2.517	2.456	2.506
sd	0.274	0.274	0.274	0.287	0.261	0.258	0.270	0.281
<i>Covariates</i>								
Female share	0.497	0	1	0.336	0.486	0.558	0.548	0.361
BBL share	0.275	0.349	0.203	0.393	0.445	0.146	0	1
Migrant share	0.177	0.165	0.186	0.214	0.150	0.175	0.207	0.093
Age at graduation	21.15	21.19	21.11	19.94	21.32	21.50	20.90	21.81
Observations	296,106	149,075	147,031	55,207	82,203	158,696	214,708	81,398
		By sector of employment			By firm size			
		LSS	Goods	HSS	Small (<50)	Medium	Large (>200)	Very large (>2000)
		(9)	(10)	(11)	(12)	(13)	(14)	(15)
<i>Skills</i>								
Basic content		0.255	0.288	0.178	0.237	0.255	0.198	0.199
Basic process		0.072	0.059	0.086	0.072	0.075	0.082	0.081
Social		0.093	0.046	0.148	0.094	0.093	0.141	0.129
Resource management		0.065	0.059	0.086	0.061	0.066	0.094	0.080
Technical		0.143	0.221	0.100	0.155	0.153	0.111	0.104
Log hourly wage		2.346	2.543	2.534	2.398	2.464	2.527	2.520
sd		0.248	0.273	0.258	0.254	0.251	0.283	0.283
Observations		106,332	40,504	148,436	109,939	41,830	76,900	67,437

*Note:* Authors' calculations using non-public microdata from Statistics Netherlands and curriculum data from SBB. Skill frequencies are calculated using equation 1. Log hourly wage is calculated as contracted monthly income divided by contracted monthly hours in 24 months after graduation. Sample only includes graduates that found employment, students who are unemployed or continued studying are excluded. BOL stands for school-based learning, and BBL stands for apprenticeship-based training. LSS stands for low skilled services and contains the industries: wholesale and retail trade (NACE code G), transportation and storage (H), accommodation and food services (I), culture sports and recreation (R) and other service activities (S). The goods sector contains: agriculture, forestry and fishing (A), mining and quarrying (B), manufacturing (C) and construction (F). HSS (high skilled services) contains: electricity, gas, steam and air conditioning supply (D), water supply (E), information and communication (J), financial institutions (K), renting, buying and selling of real estate (L), professional, scientific and technical services (M), renting and leasing, and support services (N), public administration (O), education (P), human health and social work (Q).

Table A3: OLS Regression of Log Hourly Wages 12 months after Graduation on Skills

	Demographic covariates				Programme covariates		
	(1) No ctrl	(2) Gender	(3) Migrant	(4) Age	(5) Level	(6) Type	(7) School
Basic process	-0.017 (0.252)	0.017 (0.246)	0.017 (0.248)	-0.028 (0.212)	-0.014 (0.205)	0.003 (0.205)	0.107 (0.195)
Social	0.418** (0.189)	0.487*** (0.179)	0.487*** (0.180)	0.437*** (0.157)	0.468*** (0.163)	0.471*** (0.164)	0.487*** (0.160)
Resource management	1.015*** (0.241)	1.041*** (0.240)	1.050*** (0.240)	0.753*** (0.215)	0.668*** (0.216)	0.644*** (0.215)	0.606*** (0.202)
Technical	0.000 (0.151)	-0.015 (0.147)	-0.014 (0.149)	0.012 (0.127)	0.104 (0.125)	0.069 (0.130)	0.106 (0.133)
<i>Other</i>							
Specific	-0.299** (0.119)	-0.252** (0.120)	-0.246** (0.121)	-0.151 (0.103)	-0.119 (0.103)	-0.135 (0.105)	-0.122 (0.104)
General	0.153 (0.107)	0.162 (0.104)	0.161 (0.105)	0.148* (0.088)	0.172* (0.090)	0.177* (0.090)	0.208** (0.089)
Constant	2.171*** (0.091)	2.177*** (0.089)	2.173*** (0.090)	0.931*** (0.121)	0.929*** (0.111)	0.973*** (0.118)	0.943*** (0.120)
Observations	287,876	287,876	287,876	287,876	287,876	287,876	287,876
R-squared	0.136	0.140	0.141	0.274	0.284	0.288	0.305

Note: \*\*\* p<.01, \*\* p<.05, \* p<.1. All models are estimated with robust standard errors, clustered at the curriculum level. All skill coefficients are relative to the base category, basic content skills. Demographic controls: female (dummy), migrant (dummy), age at graduation. Program controls: ISCED level of education (2,3 and 4), apprenticeship type (BOL/BBL) and school dummies. BOL stands for school-based learning, and BBL stands for apprenticeship-based training.

Table A4: OLS Regression of Log Hourly Wages 48 months after Graduation on Skills

	Demographic covariates				Programme covariates		
	(1) No ctrl	(2) Gender	(3) Migrant	(4) Age	(5) Level	(6) Type	(7) School
Basic process	-0.104 (0.202)	-0.031 (0.180)	-0.031 (0.181)	-0.053 (0.168)	-0.048 (0.160)	-0.032 (0.161)	0.053 (0.150)
Social	0.185 (0.158)	0.268* (0.140)	0.268* (0.140)	0.253* (0.132)	0.291** (0.136)	0.291** (0.137)	0.311** (0.134)
Resource management	0.740*** (0.213)	0.717*** (0.199)	0.718*** (0.198)	0.605*** (0.187)	0.541*** (0.189)	0.514*** (0.188)	0.478*** (0.174)
Technical	0.000 (0.127)	-0.020 (0.113)	-0.020 (0.114)	-0.006 (0.108)	0.072 (0.102)	0.037 (0.107)	0.074 (0.108)
<i>Other</i>							
Specific	-0.169* (0.096)	-0.132 (0.085)	-0.131 (0.085)	-0.092 (0.080)	-0.042 (0.082)	-0.058 (0.084)	-0.046 (0.082)
General	0.086 (0.086)	0.105 (0.077)	0.105 (0.077)	0.098 (0.072)	0.114 (0.071)	0.117 (0.072)	0.144** (0.070)
Constant	2.438*** (0.076)	2.464*** (0.068)	2.463*** (0.068)	1.979*** (0.087)	1.985*** (0.079)	2.031*** (0.081)	2.008*** (0.079)
Observations	203,850	203,850	203,850	203,850	203,850	203,850	203,850
R-squared	0.106	0.145	0.145	0.177	0.188	0.195	0.218

Note: \*\*\* p<.01, \*\* p<.05, \* p<.1. All models are estimated with robust standard errors, clustered at the curriculum level. All skill coefficients are relative to the base category, basic content skills. Demographic controls: female (dummy), migrant (dummy), age at graduation. Program controls: ISCED level of education (2,3 and 4), apprenticeship type (BOL/BBL) and school dummies. BOL stands for school-based learning, and BBL stands for apprenticeship-based training.

Table A5: OLS Regression of Log Hourly Wages 24 months after Graduation on Skills, including selection covariates

	Selection covariates				
	(1) Baseline	(2) Sample	(3) Field	(4) Industry	(5) Firm size
Basic process	0.079 (0.168)	0.077 (0.168)	-0.096 (0.065)	-0.075 (0.057)	-0.073 (0.054)
Social	0.396*** (0.145)	0.368** (0.144)	-0.107 (0.083)	-0.200** (0.082)	-0.185** (0.076)
Resource management	0.548*** (0.182)	0.581*** (0.191)	0.544*** (0.134)	0.374*** (0.131)	0.301** (0.117)
Technical	0.078 (0.118)	0.077 (0.118)	-0.102*** (0.035)	-0.129*** (0.035)	-0.122*** (0.034)
<i>Other</i>					
Specific	-0.097 (0.091)	-0.090 (0.093)	0.088 (0.129)	-0.011 (0.123)	-0.004 (0.109)
General	0.180** (0.078)	0.179** (0.078)	0.019 (0.032)	-0.027 (0.029)	-0.026 (0.028)
Constant	1.457*** (0.097)	1.459*** (0.098)	1.623*** (0.069)	1.667*** (0.059)	1.690*** (0.058)
Observations	296,106	289,800	289,800	289,799	289,799
R-squared	0.287	0.288	0.374	0.426	0.436

Note: \*\*\* p<.01, \*\* p<.05, \* p<.1. All models are estimated with robust standard errors, clustered at the curriculum level. All skill coefficients are relative to the base category, basic content skills. Demographic controls: female (dummy), migrant (dummy), age at graduation. Program controls: ISCED level of education (2,3 and 4), apprenticeship type (BOL/BBL) and school dummies. BOL stands for school-based learning, and BBL stands for apprenticeship-based training. Field controls include ISCED 1 digit field of education and domains. Industry is 1 digit SBI code used by Statistics Netherlands, which corresponds to the first letters in NACE industry codes. Firm size is divided into four categories: small (<50), medium (<250), large (<2000) and large (2000+).

Table A6: Baseline results: by sector of employment

	(1) total	(2) Low skill services	(3) Goods	(4) High skill services
Basic process	0.079 (0.168)	-0.012 (0.064)	0.076 (0.092)	-0.018 (0.139)
Resource management	0.548*** (0.182)	-0.193** (0.094)	0.365*** (0.127)	0.715*** (0.202)
Social	0.396*** (0.145)	-0.006 (0.043)	-0.143 (0.098)	0.422*** (0.117)
Technical	0.078 (0.118)	0.086* (0.047)	-0.142** (0.056)	-0.066 (0.093)
Observations	296,106	106,332	40,504	148,436
R-squared	0.287	0.325	0.375	0.298

Note: \*\*\* p<.01, \*\* p<.05, \* p<.1. All models are estimated with robust standard errors, clustered at the curriculum level. All skill coefficients are relative to the base category, basic content skills. All estimations include gender, migrant, age at graduation, type (BBL/BOL) and school dummies. BOL stands for school-based learning, and BBL stands for apprenticeship-based training. Constant is included, but not reported.

Table A7: **Baseline results: by firm size (number of employees)**

	(1) Baseline	(2) Small <50	(3) Medium <250	(4) Large <2000	(5) Very large 2000+
Basic process	0.079 (0.168)	0.116 (0.145)	0.003 (0.155)	0.071 (0.210)	0.038 (0.151)
Social	0.396*** (0.145)	0.280*** (0.096)	0.230** (0.114)	0.463*** (0.171)	0.416** (0.162)
Resource management	0.548*** (0.182)	0.064 (0.131)	0.347** (0.163)	0.677*** (0.175)	0.630*** (0.196)
Technical	0.078 (0.118)	0.088 (0.095)	0.011 (0.104)	0.087 (0.151)	0.159 (0.116)
Observations	296,106	109,939	41,830	76,900	67,437
R-squared	0.287	0.282	0.271	0.298	0.294

Note: \*\*\* p<.01, \*\* p<.05, \* p<.1. All models are estimated with robust standard errors, clustered at the curriculum level. All skill coefficients are relative to the base category, basic content skills. All estimations include gender, migrant, age at graduation, type (BBL/BOL) and school dummies. BOL stands for school-based learning, and BBL stands for apprenticeship-based training. Constant is included, but not reported.

Table A8: **Results by graduation year, 24 months after graduation**

	(1)	(2)	(3)	(4)	(5) By graduation year		(7)	(8)
	Baseline	2012	2013	2014	2015	2016	2017	2018
Basic process	0.079 (0.168)	0.234 (0.173)	0.127 (0.181)	0.091 (0.185)	0.077 (0.173)	0.025 (0.160)	0.016 (0.163)	0.032 (0.165)
Social	0.396*** (0.145)	0.493*** (0.157)	0.408*** (0.148)	0.403*** (0.149)	0.363** (0.145)	0.356*** (0.136)	0.402*** (0.143)	0.385*** (0.147)
Resource management	0.548*** (0.182)	0.522** (0.209)	0.524*** (0.197)	0.547*** (0.192)	0.531*** (0.182)	0.553*** (0.165)	0.545*** (0.171)	0.606*** (0.187)
Technical	0.078 (0.118)	0.111 (0.115)	0.040 (0.123)	0.081 (0.128)	0.073 (0.122)	0.101 (0.114)	0.079 (0.115)	0.073 (0.118)
Constant	1.457*** (0.097)	1.275*** (0.110)	1.349*** (0.104)	1.329*** (0.116)	1.468*** (0.106)	1.536*** (0.105)	1.734*** (0.089)	1.823*** (0.085)
Observations	296,106	32,520	34,818	38,147	42,958	45,548	49,864	52,251
R-squared	0.287	0.252	0.247	0.262	0.255	0.248	0.248	0.252

Note: \*\*\* p<.01, \*\* p<.05, \* p<.1. All models are estimated with robust standard errors, clustered at the curriculum level. The reference category for the skills is the category of basic content skills. All estimations include gender, migrant, age at graduation, type (BBL/BOL) and school dummies. BOL stands for school-based learning, and BBL stands for apprenticeship-based training.

Table A9: Sensitivity analysis to the inclusion of high school and parental income covariates

	High school level and exam			Parental income		
	(1) Sample	(2) HS level	(3) HS grade	(4) Sample	(5) Father	(6) Both
Basic process	0.043 (0.173)	0.044 (0.172)	0.047 (0.171)	0.053 (0.162)	0.053 (0.162)	0.053 (0.162)
Social	0.402*** (0.145)	0.403*** (0.145)	0.400*** (0.144)	0.354*** (0.133)	0.354*** (0.133)	0.354*** (0.133)
Resource management	0.559*** (0.183)	0.559*** (0.183)	0.562*** (0.183)	0.574*** (0.182)	0.574*** (0.182)	0.574*** (0.182)
Technical	0.069 (0.120)	0.069 (0.120)	0.065 (0.118)	0.078 (0.106)	0.078 (0.106)	0.078 (0.106)
Constant	1.448*** (0.101)	1.436*** (0.103)	1.252*** (0.122)	0.893*** (0.152)	0.870*** (0.155)	0.877*** (0.158)
Observations	257,419	257,419	243,305	80,696	80,696	80,696
R-squared	0.289	0.290	0.288	0.297	0.297	0.297

Note: \*\*\* p<.01, \*\* p<.05, \* p<.1. All models are estimated with robust standard errors, clustered at the curriculum (crebo) level. The reference category for the skills is the category of basic content skills. High school (HS) levels include pre-mbo level 1 to 4, and pre-applied university and pre-university high school education. High school (HS) exam grade is the average grade of all exam courses in high school. Parental income is the yearly income of the parents at the time when the student was 15.